MAGNESIUM

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U.S. primary magnesium consumption increased slightly in 2003. Diecasting was the leading magnesium-consuming application, accounting for nearly one-half of domestic consumption. With only one U.S. magnesium producer, imports continued to supply a significant portion of U.S. magnesium demand. Imports for consumption in 2003 were 5% lower than those in 2002. Of the total quantity of magnesium imported into the United States, Canada (41%), Russia (26%), China (15%), and Israel (7%) were the principal sources in 2003.

Backers of proposed magnesium plants in Australia suffered financial setbacks, and construction of a plant in Queensland, Australia, was stopped. The plant that recovered magnesium from asbestos tailings in Canada was closed indefinitely because of competition from magnesium from China. Magnesium producers in China continued to announce capacity increases for primary metal and magnesium alloys.

Legislation and Government Programs

In its annual review of the antidumping duty for pure magnesium from Canada, the U.S. Department of Commerce, International Trade Administration (ITA) determined that, for the August 1, 2000, to July 31, 2001, period, the antidumping duty for pure magnesium from Norsk Hydro Canada Inc. was 0% ad valorem, the same as it had been (U.S. Department of Commerce, International Trade Administration, 2003d). The ITA also made a final ruling on the antidumping duty for the August 1, 2001, to July 31, 2002, period, and it determined that the rate for Norsk Hydro Canada was 0.01% ad valorem. Because the rate is less than 0.5%, however, no cash deposit will be required on imports of pure magnesium (U.S. Department of Commerce, International Trade Administration, 2003f).

For the countervailing duty on pure and alloy magnesium from Canada, the ITA made a final determination that the rate for calendar year 2001 was 1.68% ad valorem (U.S. Department of Commerce, International Trade Administration, 2003c). The ITA also made a final determination that alloy magnesium from Magnola Metallurgy Inc. was subject to a countervailing duty of 7.00% ad valorem for calendar year 2001. This determination was made after Magnola requested a new shipper review in February 2002 (U.S. Department of Commerce, International Trade Administration, 2003a).

After the NAFTA Secretariat remanded the antidumping duty determination for pure magnesium from Canada back to the ITA a second time, the Government of Quebec and Norsk Hydro Canada Inc. filed rule 73(2)(b) challenges to the second redetermination on February 27, and the ITA filed a responsive brief on March 19. Both the Government of Quebec and Norsk Hydro challenged each of the conclusions in the second redetermination and requested that the panel again remand the ITA's decision with instructions to remove the antidumping duty order. After considering the ITA's arguments, the NAFTA panel ordered the ITA to remove the antidumping duty order, which the ITA did in July (U.S. Department of Commerce, International Trade Administration, 2003e; Organization of American States, 2003§[1]).

On September 24, the Office of the U.S. Trade Representative filed a request for an extraordinary challenge committee to review the decisions issued by the NAFTA panel on the final antidumping duty determinations on imports of pure magnesium from Canada. This panel was established to act in place of national courts to review the final determination on the full sunset review to determine whether it conforms with the antidumping duty law of the country that made the determination (U.S. Department of Commerce, International Trade Administration, 2003b).

In the countervailing duty investigation of pure and alloy magnesium from Canada, the NAFTA panel concluded that, in this case, the ITA's reporting of an "all others" subsidy rate was neither supported by substantial evidence nor in accordance with law and required that the ITA amend its determination to exclude an "all others" subsidy rate. The panel, however, agreed with the ITA that there was no good cause to investigate alleged subsidies received by Magnola Metallurgy Inc. because there was no indication that the company had produced magnesium. As a result of the panel's conclusion, the ITA removed the "all others" rate (U.S. Department of Commerce, International Trade Administration, 2003g; Organization of American States, 2002§).

The U.S. Environmental Protection Agency (EPA) issued its final rule on emissions of hazardous air pollutants for primary magnesium plants. The rule affected only U.S. Magnesium LLC, which must comply with the regulations before October 11, 2004. The final rule set emission limits for chlorine, hydrochloric acid (HCl), particulate matter (PM), particulate matter less than 10 micrometers in size (PM10), and dioxin/furan. The emission points covered by the rule are the spray dryers (HCl, PM), magnesium chloride storage bins (HCl, PM10), melt-reactor system (chlorine, HCl, PM10, dioxin), and the launder offgas system (chlorine, HCl, PM). The standard also addresses fugitive dust emissions (U.S. Environmental Protection Agency, 2003).

[1]References that include a section mark (§) are found in the Internet References Cited section.

Production

U.S. Magnesium expected to return to its full 45,000-metric-ton-per-year (t/yr) capacity at its Rowley, UT, plant by February 2003 after completing the installation of new electrolytic cell technology. The company consolidated operations into two buildings from four and expected to be able to produce the same quantity of magnesium as before, with fewer cells. U.S. Magnesium also planned to complete an engineering study by summer 2003 to assess the feasibility of increasing production to 80,000 t/yr by introducing the new cells into the two closed buildings (Brooks, 2003e).

Environment

The cover gas sulfur hexafluoride (SF_6) that is used to protect molten magnesium from oxidation has been implicated as a potential factor in global warming. Although studies on its effect continue, its long atmospheric life (about 3,000 years) and high potential as a greenhouse gas (23,900 times the global warming potential of carbon dioxide) has resulted in a call for voluntary reductions in its emissions. In 1999, the U.S. magnesium industry, the International Magnesium Association, and the EPA began a voluntary partnership to understand and reduce emissions of SF_6. By 2002, SF_6 emissions were reduced by more than 40% (U.S. Environmental Protection Agency, 2004§). Also in 2002, the EPA concluded a 3-year cooperative study with the International Magnesium Association to identify viable alternative cover gases. This successful investigation identified promising alternatives, such as hydroflurocarbon 134a, Novec™ 612 (a fluorinated ketone manufactured by 3M Corp.), and hydrofluoroethers.

A report from the European Commission recommended banning SF_6 used as a cover gas for magnesium melting operations in production, diecasting, and remelting. The report proposed banning SF_6 by 2006 except in operations that produce less than 500 metric tons (t) of magnesium parts or use less than 500 kilograms (kg) of SF_6. The report recommended replacing SF_6 with sulfur dioxide, which is difficult to handle and toxic (Metal Bulletin, 2003b).

Consumption

Reported primary magnesium consumption in 2003 was about the same as that in 2002, although secondary consumption fell slightly (tables 2, 3). Diecasting, with a 6% increase, was the sector with the largest quantity growth in primary consumption from 2002 to 2003, even though light vehicle production in the United States fell by 1.6% (WardsAuto.com, 2004§). Diecasting remained the leading use for primary magnesium, accounting for 47% of the total, followed by aluminum alloying with 33% and iron and steel desulfurization with 8%. Data for magnesium metal are collected from two voluntary surveys of U.S. operations by the U.S. Geological Survey. Of the 80 companies canvassed for magnesium consumption data, 45% responded, representing 33% of the magnesium consumption listed in tables 2 and 3. Data for the 44 nonrespondents were estimated on the basis of prior-year consumption levels and other factors. One large aluminum producer accounted for nearly one-half of the nonresponse total quantity.

The former chief executive officer of Xstrata Magnesium Corp. purchased the Anderson, IN, magnesium recycling operation for $1.2 million. Xstrata AG, the parent company, had announced in February that it wanted to sell the plant because it could not secure sufficient supplies of magnesium scrap feed. The new owner named the operation Advanced Magnesium Alloys Corp. (Amacor). By yearend, Amacor planned to double production capacity at the plant from its current level of 25,000 t/yr by installing a second production line (Brooks, 2003b).

Rossborough-Remacor LLC, a large desulfurization reagent producer, filed for Chapter 11 bankruptcy protection in June. Much of the company's production was sold to steel producers, and the recent bankruptcy filings of many U.S. steel producers cost Rossborough-Remacor more than $5.5 million during the past 3 years (Platts Metals Week, 2003e). A private investment firm, Magnesium Technologies Inc., purchased Rossborough-Remacor LLC's reagent business segment in December. The reagent business included all of Rossborough-Remacor's iron desulfurization products and other magnesium-base products, production facilities in Walkerton, IN, and equipment located at customers' plants. The new firm will continue to do business under the Rossborough name (American Metal Market, 2003d). Rossborough-Remacor's Avon Lake, OH, and West Pittsburg, PA, plants were not included in the sale. On October 31, Remacor Inc., a newly formed corporation in West Pittsburg, PA, purchased Rossborough-Remacor's equipment and technology for processing secondary magnesium scrap. Remacor planned to install equipment utilizing new technology that processes post-consumer scrap, oily magnesium turnings, and oily magnesium scrap into magnesium granules to expand the plant's capacity to 10,000 t/yr from 2,400 t/yr over a 2-year period. The project was estimated to cost approximately $2.5 million (Magnesium.com, 2003b§).

In August, Magnesium Elektron North America purchased Spectrulite Consortium Inc., one of the leading U.S. producers of magnesium wrought products, for $3 million. Spectrulite filed for Chapter 11 bankruptcy protection on January 29. Magnesium Elektron will lease the magnesium foundry in Madison, IL, and purchase a plant in Findlay, OH (Nordic Magnesium Cluster, 2003f§).

On December 29, 2003, a fire at Garfield Alloys Inc.'s magnesium recycling plant in Garfield Heights, OH, destroyed the plant. The fire burned for 2 days, and magnesium scrap that had gotten wet exploded, but no one was seriously injured. A spark from a grinder used to open one of the metal drums containing the scrap was cited as the cause of the fire. Garfield Alloys' owners have said that they plan to rebuild the plant, but no timetable has been set. At the Garfield Heights plant, the company processed types II, III, and IV magnesium scrap; Garfield Alloys also owns a plant in nearby Bellevue, OH, that processes higher grade type I scrap. Some of the company's recycling has been shifted to the Bellevue plant (Brooks, 2004; Associated Press, 2003§).

General Motors Corp. (GM) planned to use magnesium alloy for the instrument panel support beams of its 2005 model Pontiac Grand Am convertible and may use magnesium alloy for the retractable hardtop roofs as well. The support beams will be purchased from Meridian Technologies Inc., Strathroy, Ontario, Canada (Wrigley, 2003b). GM, however, chose aluminum rather than magnesium for the transfer case covers for its new Chevrolet Colorado and GMC Canyon pickup trucks because the weight savings from using magnesium were not needed.

GM decided to replace the magnesium instrument panel support beams on its Chevrolet Silverado and GMC Sierra pickup trucks with steel beams. According to the company, changes in other areas of the pickup trucks made it unnecessary to use magnesium beams for weight reduction. The new steel beams were designed in such a way that they would not require as many pieces and, consequently, fewer welds or fasteners; before the mid-1990s, steel beams consisted of as many as 40 pieces (Wrigley, 2003d).

Ford Motor Co. planned to use nearly 5,000 t/yr of magnesium diecastings in its first-of-a-kind front-end support assemblies for its 2004 model redesigned standard-size F-150 pickup truck. The magnesium assemblies would replace more than 10,000 t/yr of parts made of flat-rolled steel previously used in F-150s. It will mark the first time that magnesium has replaced steel in this application in any North American-built truck or car. Because magnesium is lighter than steel and the new assemblies will be produced in a way that allows components and features made of steel and other materials to be integrated into the diecastings, the unusual front-end support assemblies in the new F-150 pickup trucks will result in a weight savings of more than 9 kg (20 pounds) per vehicle. As cast, the magnesium supports weigh 6.2 kg (13.8 pounds) each. The AM50 supports will be purchased from Meridian Technologies (Wrigley, 2003a).

Ford chose aluminum instead of magnesium for the camshaft covers in its next-generation V-6 engines. The cost of magnesium compared with that of aluminum was cited as the main reason. Ford used magnesium alloy AZ91 camshaft covers on its 5.4-liter Triton V-8 engines and was expanding its use to other Triton V-8 and V-10 engines, where it has replaced plastic. Ford said that most of its future engines would use aluminum camshaft covers unless the price of magnesium decreases and approaches that of competing aluminum alloys (Wrigley, 2003c).

Stocks

Producers’ yearend 2003 stocks of primary magnesium decreased from those at yearend 2002; producer stock data were withheld to avoid disclosing company proprietary data. Consumer stocks of primary and alloy magnesium were 6,310 metric tons (t) at yearend 2003, a 6% increase from the yearend 2002 level of 5,950 t (revised). Secondary magnesium stocks fell slightly to 2,150 t at yearend 2003 from 2,270 t (revised) at yearend 2002.

Prices

Quoted magnesium prices did not change significantly in 2003, with the exception of the China free market price (table 4). In the first quarter of 2003, the China free market price increased by about $200 per metric ton; this increase was most likely in response to the anticipation of the European antidumping duty on imports of magnesium from China being lifted. Near yearend, increased costs for ferrosilicon, used to produce magnesium, and freight in China combined with electricity shortages drove prices up.

Foreign Trade

Total magnesium exports for 2003 were about 20% less than those in 2002 (table 5). Canada (64%), the Netherlands (19%), and Mexico (10%) were the main destinations. Imports for consumption in 2003 were 5% lower than those in 2002 (table 6). Of the total quantity of magnesium imported into the United States, Canada (41%), Russia (26%), China (15%), and Israel (7%) were the principal sources in 2003. Nearly one-half the magnesium imported in 2003 was as alloy, and about one-third was in the form of pure metal. Canada and China together supplied 85% of the magnesium alloy imports, and Russia provided about two-thirds of the pure magnesium imports in 2003.

World Review

European Union.—On April 1, the European Union (EU) removed its antidumping duty on imports of magnesium from China. Removal of this duty had been anticipated since Pechiney closed the last primary magnesium plant operating in the EU in July 2002. Prices in China had been rising at a faster rate than other free market prices on anticipation of the removal of the duty (Francis-Grey, 2003).

Australia.—Australian Magnesium Corp. Ltd. (AMC) mothballed plans for its proposed 97,000-t/yr magnesium plant in June when it could not secure additional funding for construction. AMC said all activities had been halted at Stanwell, and the majority of its staff was laid off in mid-July 2003. The company also said its demonstration plant at Gladstone would be completely dormant by the end of September 2003 (Nordic Magnesium Cluster, 2003a§). In addition, Ford dissolved its 45,000-t/yr, 10-year supply deal with AMC, worth an estimated $1.3 billion. Ford accepted a $20 million loss with its withdrawal (Clarke, 2003).

After several years of evaluating sites in Australia, Mt. Grace Resources Ltd. announced in January that it was planning to construct a magnesium plant in Malaysia. The company planned to purchase the Northwest Alloys Inc. plant from Alcoa Inc. for $21 million, dismantle it, and then ship the plant from its location in Addy, WA, to Malaysia. Mt. Grace Resources, which changed its name to

New World Alloys Ltd. in 2003, planned to increase the plant's capacity to 90,000 t/yr at a cost of $150 million (New World Alloys Ltd., 2003a§). But by April, New World Alloys reneged on the purchase of the former Northwest Alloys plant because it could not raise sufficient funding (American Metal Market, 2003c). By August, the company announced that it would look at locations in South Africa, rather than Malaysia as originally planned, to install a magnesium production plant. Less expensive power costs in South Africa were cited as the reason for the change in proposed location (New World Alloys Ltd., 2003b§).

In April, Magnesium International Ltd. (MIL) completed a strategic review of its SAMAG magnesium smelter project that is planned for Port Pirie, South Australia. The company planned to increase the plant's total capacity by 18% to 84,000 t/yr and construct the plant in two modules. Module one (41,000 t/yr) would cost an estimated A$683 million. With the increased capacity, cash operating cost at full capacity would be reduced to US$0.57 per pound of magnesium from the original projection of US$0.59 per pound (Magnesium International Ltd., 2003d§).

MIL raised A$2.9 million in a rights issue that closed on June 30, 2003. The company had attempted to raise A$8.3 million through the offering. Although the company had an additional 3 months to raise the remaining funding, it decided not to make placements of the shortfall shares within the permitted period. Instead, MIL decided to operate within the constraints of the available funding. As a result, the company began a detailed evaluation of all costs and made changes to try to reduce ongoing expenditures (Magnesium International Ltd., 2003a§).

Because of the financial difficulties with AMC's proposed magnesium plant, the Government of South Australia began a review of MIL's proposed SAMAG magnesium plant in June. The review was completed at the end of July, and the Government reaffirmed its commitment to provide A$25 million in infrastructure support (MineBox, 2003a§). In June, MIL and Thiess Pty. Ltd. signed a memorandum of understanding (MOU) involving the funding of SAMAG. The MOU committed Thiess to contribute equity to the project on the award of an exclusive engineering, procurement, and construction contract for the first module of the plant with a capacity of 41,000 t/yr to be completed by 3 years from the date of financial closure of the project. Thiess would contribute up to $13.4 million of equity to the project, with the final amount being dependent on the terms of the final contract, which was expected to have a value of $336 million (Magnesium International Ltd., 2003b§).

Although it had approval to construct a primary magnesium plant in Port Pirie, MIL was considering alternative locations in Queensland and Victoria. The company cited lower power cost as the principal reason to consider other sites. A decision was expected in the first half of 2004. MIL also signed an extension of its agreement with Germany's ThyssenKrupp Metallurgie GmbH covering the purchase of the entire output of the proposed magnesium plant (Nordic Magnesium Cluster, 2003g§).

Latrobe Magnesium Ltd. (formerly Rambora Technologies Ltd.) received A$1.4 million from the Government of Victoria toward a A$20 million feasibility study to determine if the project to recover magnesium from coal fly ash had the potential to be successful. In June 2002, Latrobe Magnesium released the results of an earlier feasibility study to construct a 100,000-t/yr magnesium plant in the LaTrobe Valley, Victoria, that estimated the capital cost of the plant to be A$857 million, and the direct operating cost, A$0.705 per pound (MineBox, 2003b§). In conjunction with Alcan International Inc., a pilot plant has been sized, and the company has been examining a selection of potential locations within the LaTrobe Valley for the pilot-plant site. Latrobe Magnesium was finalizing the contract details with Alcan International for the supply of the dehydration technology and the subsequent commercialization of that process. Discussions were underway with potential organizations for offtake agreements (Metal Bulletin, 2003a).

Brazil.—In April, the Government of Brazil began an investigation into the dumping of magnesium ingot from China into Brazil's market. The investigation was initiated by the sole magnesium producer in the country, Rima Industrial, which produced about 12,000 t/yr of magnesium ingot and alloy. The Government expected that the investigation would be completed within 1 year (Platts Metals Week, 2003d).

Canada.—At the end of April, Magnola closed its 58,000-t/yr primary magnesium plant in Quebec because of competition from low-priced magnesium from China. The plant, which has been operating for about 2 years, was expected to be closed for at least 1 year, but it could be closed longer if magnesium prices do not increase. Exacerbating the problem of low magnesium prices was the technical problems the plant had encountered since its startup in December 2000. The plant was using asbestos tailings as a raw material source and had encountered problems in introducing new recovery technology; the plant produced 24,600 t in 2002, which was less than one-half its rated capacity (Brooks, 2003d).

Safeguard International Fund signed a letter of intent to purchase 6 million shares of Timminco Ltd. in March, and Timmins Investments Inc., the largest shareholder in Timminco, will commit its holding to a voting trust controlled by Safeguard. Safeguard will then make a public offering to acquire an additional 4 million shares of stock. These transactions would give Safeguard a majority control in Timminco and would finalize Timminco's financial restructuring, which had begun in 2001 (Brooks, 2003a).

Hatch Associates Ltd. completed its feasibility study for Leader Mining International Inc.'s proposed magnesium plant in British Columbia. Total plant capacity was projected to be 131,000 t/yr of magnesium metal and alloys, and production technology would be sourced through a technology transfer agreement with Ukraine's State Research and Design Titanium Institute and Russia's JSC VAMI. Hatch determined that the construction cost for the proposed plant would be $1.24 billion, and the operating cost would be $0.70 per pound of magnesium (Leader Mining International Inc., 2003§).

China.—China continued to increase its production capacity for magnesium ingot and alloy and to announce future increases. Many of the future increases, however, will depend on funding from international investors. Production in China has increased significantly within the past 5 years; in 2004, magnesium production in China equaled world magnesium production in 1999 (excluding U.S. production).

In August, Shanxi Wenxi Baiyu Co. Ltd. completed the first phase of its expansion project to increase its magnesium production capacity to 10,000 t/yr from 5,000 t/yr. The company announced that it would expand production capacity further to 30,000 t/yr by the end of 2003. Shanxi Reicheng Hengfa Corp. planned to increase its magnesium ingot production capacity to 12,000 t/yr from 4,000 t/yr by March 2004. The company also announced that it would begin a 15,000-t/yr magnesium alloy project in 2004 (Nordic Magnesium Cluster, 2003c§). In August, Jilin North Industrial Silicon Corp. installed new magnesium alloy production capacity and upgraded its equipment to increase the company's combined alloy and ingot output to 12,000 t/yr—6,000 t/yr of ingot production and 6,000 t/yr of alloy production (Nordic Magnesium Cluster, 2003e§).

Ningxia Huayuan Magnesium Smelter added 6,000 t/yr of production capacity to its primary magnesium plant, bringing the total capacity up to 14,000 t/yr (Nordic Magnesium Cluster, 2003i§).

A new China-Hong Kong joint-venture magnesium firm, Yuxing Hongfu Magnesium Co., planned to construct a 50,000-t/yr magnesium plant in Shanxi Province. The first phase of 10,000 t/yr was scheduled to be completed in October, and a second phase of 20,000 t/yr was scheduled for August 2004. The entire project was to be completed by 2005 (Platts Metals Week, 2003c).

Shanxi Qizhen Magnesium Corp. increased its ingot and powder production capacities in October. Ingot capacity was increased to 8,000 t/yr from 5,000 t/yr, and powder capacity was increased to 7,000 t/yr from 4,000 t/yr. In addition, the company planned to increase magnesium alloy production capacity to 20,000 t/yr and add 5,000 t/yr of magnesium extrusion capacity by 2004 (China Metal Market, 2003).

Chongqing Magnesium Science and Technology Co. Ltd. completed a 1,500-t/yr magnesium alloy and scrap magnesium recovery production line at its magnesium plant in Wansheng, Chongqing. In addition, the company also planned a second magnesium scrap production line, scheduled to begin construction in the second half of 2003, which was designed to produce 3,000 t/yr of magnesium alloy (Nordic Magnesium Cluster, 2003d§).

Shanxi Wenxi Hongfu Corp. planned to increase its magnesium alloy production capacity by 5,000 t/yr to 15,000 t/yr by the end of 2003. The company started the capacity increase near the end of September and expected to complete it by the end of November (Magnesium.com, 2003c§).

Guangling Jinghua Corp. started its 10,000-t/yr magnesium alloy production line in December. Once the new line becomes fully operational, the company planned to close an older 8,000-t/yr alloy line. In addition, the company planned to double ingot production to 20,000 t/yr by 2004 and planned a further production increase to 40,000 t/yr by 2005 (Platts Metals Week, 2003a).

Shanxi Zhongjin Corp. announced that it would double its magnesium production capacity to 7,000 t/yr by August 2004. The company planned to install additional furnaces and upgrade the plant to achieve the capacity increase (Nordic Magnesium Cluster, 2003b§).

In June, the Governments of Henan Province and Jiaozuo City and Yellow River Magnesium Product Co. Ltd. announced that they began construction of a 10,000-t/yr magnesium ingot production line costing $3.38 million, and planned to complete four additional projects by 2007. The second project, beginning in 2004, was to construct a 10,000-t/yr magnesium alloy production line and upgrade a 1,500-t/yr magnesium plate production line at a cost of $2.42 million. The third project, beginning in 2005, was for a 1,000-t/yr magnesium alloy profile production line costing $7 million to be followed in 2006 by the fourth project for a 2,000-t/yr direct die-cast magnesium alloy production line at a further investment of $9.06 million. In 2007, the company planned to set up a 1,000-t/yr magnesium alloy wheel hub production line for automobiles and motorcycles and a 12,500-t/yr magnesium products production line at a cost of $9.42 million (Nordic Magnesium Cluster, 2003k§).

Minhe Magnesium Co. in Qinghai Province announced that it would increase magnesium alloy capacity by 1,000 t/yr to 4,000 t/yr in 2004. The plant has the capacity to produce 7,000 t/yr of magnesium ingot (Platts Metals Week, 2003b).

Winca Magnesium (Hebi) Co. Ltd. (a wholly owned subsidiary of U.S. firm Winca Group Inc.) planned to build a 12,000-t/yr magnesium alloy production line provided it received approval from the Government of Hebei Province. If approved, the company expected to complete the plant by June 2004 at a cost of $12.1 million. Winca Magnesium has the capacity to produce 5,000 t/yr of primary magnesium at its Hebei City plant that was constructed in 2002, and it can produce some alloys and magnesium anodes. The company exports its products to Europe and the United States (Magnesium.com, 2003e§).

Shanxi Jishan Huayu Corp. postponed the completion of the first phase of its magnesium expansion until early 2004 because of continual rain that slowed construction. The first phase of the expansion of 20,000 t/yr had been scheduled to be completed in November 2003, but the company said that the second and third projects, 20,000-t/yr each, would be completed in 2004 and 2005, respectively (Nordic Magnesium Cluster, 2003j§). Jishan Huayu began producing magnesium in 1994, with a capacity of 4,800 t/yr, and its production capacity was increased to 30,000 t/yr in 2002 with investment from two Japanese firms.

Xinlihua Magnesium Powder Co. abandoned its plans to begin magnesium alloy production at its plant in Shanxi Province because it did not receive approval from the Government of the Province to purchase the necessary equipment. Production had been originally scheduled to begin in December 2003 (Platts Metals Week, 2003f).

In addition, management restructuring at Shanxi Datong Zhongjin Magnesium Industry Co. was expected to delay the company's planned primary magnesium capacity expansion. The firm originally had planned on doubling its ingot production capacity to between 7,000 and 8,000 t/yr by August 2004 (Platts Metals Week, 2003g).

Congo (Brazzaville).—In January, Magnesium Alloy Corp. (MagAlloy) reported that, because of market conditions, it would no longer be proceeding with its private placement of 6 million units of stock that was originally announced in November 2002 (Magnesium Alloy Corp., 2003a§). Instead, the company completed a placement of 1 million units in February. The smaller placement was intended to supply working capital and general corporate expenses for the company's proposed 60,000-t/yr magnesium plant that was expected to begin production in 2007 (Magnesium Alloy Corp., 2003b§). In June, MagAlloy signed a preliminary long-term offtake agreement with Stinnes Metall GmbH (a wholly owned subsidiary of Stinnes AG). Under the agreement, Stinnes will purchase and market 100% of the magnesium and magnesium alloys that will be produced by MagAlloy's plant (Brooks, 2003c).

Germany.—Norsk Hydro Magnesium GmbH announced that it would double its magnesium recycling capacity in Bottrop to 17,500 t/yr by September 2004. The expansion, which will cost $3.1 million, was in response to increased demand in the automotive industry for die-cast components (American Metal Market, 2003a).

Netherlands.—Remag Alloys B.V. officially started up its new magnesium recycling plant on November 7. The 10,000-t/yr plant in Delfjil, Netherlands, was designed to process die-casting scrap.

Russia.—Russia's second leading aluminum maker, SUAL Holding, and JSC Uralasbest announced that they would set up a company to recycle Uralasbest's asbestos production wastes to recover magnesium. The project was estimated to cost between $100 million and $300 million. The least expensive option would be to set up magnesium production at Uralasbest's Malyshevskoye mines, making use of the existing buildings and concentrating plant. More than 4 billion metric tons of serpentinite wastes with a magnesium content of 20% to 25% have built up at Uralasbest. No timetable was scheduled for construction. The waste product at Uralasbest has been evaluated as a potential magnesium source material since 2000 (Magnesium.com, 2003d§).

Current Research and Technology

As part of its efforts to develop and evaluate engine component applications for creep-resistant, high-temperature magnesium alloys, the U.S. Automotive Materials Partnership, Southfield, MI, planned to compare an experimental magnesium cylinder block for a Ford 2.5-liter Duratec V-6 engine with the aluminum block that is used in the Ford engines. The partnership's Magnesium Powertrain Cast Components task force also will try to determine by 2006 whether magnesium can be used for bedplates, engine front covers, and oil pans (American Metal Market, 2003b).

Prior to its sale, Rossborough-Remacor had announced that it had developed a new proprietary cost-effective technology for processing oily magnesium turnings. The company had been processing this material for more than 15 years at its West Pittsburg plant. Because the existing process was not cost effective, the company had to charge fees for processing in order to continue operations. A patent was pending on the process, and Rossborough-Remacor planned a two-phase equipment installation at the West Pittsburg plant. The first phase was scheduled for completion by the first quarter of 2004. This new process was expected to create a safe and economical method of disposal of a hazardous material by conversion to a desulfurization-grade magnesium granule (Nordic Magnesium Cluster, 2003h§).

Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) and MIL announced that they have signed a conditional term sheet to enter into a venture to manufacture magnesium sheet metal using CSIRO-developed twin roll casting technology. The twin roll casting technology has the potential to produce high-quality thin magnesium sheet using less energy than traditional rolling processes. The proposal is for MIL initially to hold 40% of the venture with an option to purchase a further 10% from the CSIRO. Magnesium sheet is used in the electronics industry in a range of applications including computer casings, digital cameras, minidisc covers, and mobile phones (Magnesium International Ltd., 2003c§).

South Africa's Mintek expected to conclude a project to develop a thermal process to produce magnesium metal continuously by mid-2004 and to then seek to commercialize it with its partners Anglo American plc, Eskom Holdings Ltd., and South Africa's Department of Science and Technology. The new process was designed to minimize the labor required to produce magnesium through a thermal batch process, which is the principal production method used in China. This could help producers in countries where labor costs are higher than those in China to compete economically (Magnesium.com, 2003a§).

Magnesium Elektron's new magnesium alloy, Elektron® 21, was being evaluated for the U.S. expeditionary fighting vehicle. This vehicle operates in severe environments, including seawater, for which good corrosion-resistance characteristics are necessary. In addition, five other component manufacturers from the motorsports and aviation industries requested Elektron® 21 castings for evaluation (Magnesium Elektron, 2003§).

Outlook

The outcome of an antidumping duty investigation initiated in 2004 on imports of magnesium from China and Russia could have a significant effect on magnesium use in the United States. On February 27, U.S. Magnesium filed a petition with the U.S. International Trade Commission (ITC) claiming that imports of alloy magnesium from China and pure and alloy magnesium from Russia were harming the United States industry. Although some magnesium from China and Russia was already subject to antidumping duties, this investigation included material not included in the first sets of antidumping duties (U.S. Department of Commerce, International Trade Administration, 2004).

Since 1990, U.S. imports of magnesium from Canada, China, Israel, Russia, and Ukraine have been investigated for dumping and/or for countervailing subsidies. At yearend 2003, only imports of pure and granular magnesium from China had significant antidumping duties (pure and alloy magnesium from Canada was subject to small countervailing duties). U.S. metal and alloy imports have been increasing but have shown the effects of antidumping duty investigations. At the same time, U.S. production capacity has been decreasing. At the end of 1998, The Dow Chemical Co. closed its 60,000-t/yr plant, and in 2001, Northwest Alloys closed its 43,000-t/yr plant, leaving the United States with one producer, with a yearend 2003 capacity of 45,000 t/yr. During this time, the United States has gone from being a net exporter of magnesium to being import reliant; consumption has increased, while production has fallen significantly.

In addition, plans for new worldwide magnesium production capacity have either fallen through or have been significantly delayed. The proposed 90,000-t/yr AMC plant was originally scheduled to be completed in 2004. An additional 115,000 t/yr of production capacity in Australia had been expected to be completed by 2004 and 80,000 t/yr by 2006. MagAlloy was supposed to begin production at a 60,000-t/yr plant in Congo (Brazzaville) by 2005; this has been delayed until at least 2007. So prospects for additional sources of magnesium imported into the United States have been severely curtailed. If the recent sources of magnesium imports are eliminated because of high antidumping duties, then there will be no new sources to replace them. In a market in which the use of magnesium has been growing, such as automotive diecasting, where consumers have a choice of materials to use, they may choose a material other than magnesium because of magnesium's limited availability.

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TABLE 1
SALIENT MAGNESIUM STATISTICS[1]

(Metric tons unless otherwise specified)

	1999	2000	2001	2002	2003
United States:					
Production:					
Primary magnesium	W	W	W	W	W
Secondary magnesium	86,100	82,300	65,800	73,600	69,800
Exports	29,100	23,800	19,600	25,400	20,400
Imports for consumption	90,700	91,400	68,500	88,000	83,400
Consumption, primary	131,000	104,000	95,700	102,000 r	102,000
Yearend stocks, producer	W	W	W	W	W
Price[2] dollars per pound	1.40-1.55	1.23-1.30	1.21-1.28	1.10-1.22	1.10-1.17
World, primary production	341,000	428,000	429,000 r	450,000 r	508,000 e

[e]Estimated. [r]Revised. W Withheld to avoid disclosing company proprietary data.

[1]Data are rounded to no more than three significant digits.

[2]Source: Platts Metals Week.

TABLE 2

MAGNESIUM RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES, BY KIND OF SCRAP AND FORM OF RECOVERY[1]

(Metric tons)

	2002	2003
KIND OF SCRAP		
New scrap:		
Magnesium-base	13,400	11,000
Aluminum-base	33,700	33,700
Total	47,100	44,700
Old scrap:		
Magnesium-base	6,880	6,880
Aluminum-base	19,600	18,200
Total	26,400	25,100
Grand total	73,600	69,800
FORM OF RECOVERY		
Magnesium alloy ingot[2]	W	W
Magnesium alloy castings	929	792
Magnesium alloy shapes	247	290
Aluminum alloys	53,500	52,100
Other[3]	18,900	16,600
Total	73,600	69,800

W Withheld to avoid disclosing company proprietary data; included in "Other."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes secondary magnesium content of both secondary and primary alloy ingot.

[3]Includes chemical and other dissipative uses and cathodic protection, and data indicated by symbol W.

TABLE 3

U.S. CONSUMPTION OF PRIMARY MAGNESIUM, BY USE[1]

(Metric tons)

Use	2002	2003
For structural products:		
Castings:		
Die	45,600	48,400
Permanent mold	270	71
Sand	492	394
Wrought products[2]	4,350 r	3,190
Total	50,700 r	52,100
For distributive or sacrificial purposes:		
Aluminum alloys	34,900	33,800
Cathodic protection (anodes)	3,240 r	3,720
Iron and steel desulfurization	8,510	8,130
Reducing agent for titanium, zirconium, hafnium, uranium, beryllium	867	930
Other[3]	3,380	3,340
Total	50,900 r	50,000
Grand total	102,000 r	102,000

[r]Revised.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes sheet and plate and forgings.

[3]Includes chemicals; nodular iron; and scavenger, deoxidizer, and powder.

TABLE 4
YEAREND MAGNESIUM PRICES

Source		2002	2003
Platts Metals Week:			
U.S. spot Western	dollars per pound	1.10-1.22	1.10-1.17
U.S. spot dealer import	do.	1.02-1.07	1.05-1.10
European free market	dollars per metric ton	1,800-1,900	1,850-1,950
Metal Bulletin:			
European free market	do.	1,880-1,980	1,850-1,950
China free market	do.	1,360-1,380	1,650-1,660

TABLE 5

U.S. EXPORTS OF MAGNESIUM, BY COUNTRY[1]

Country	Waste and scrap		Metal		Alloys (gross weight)		Powder, sheets, tubing, ribbons, wire, other forms (gross weight)	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2002:								
Canada	5,790	$14,400	6,990	$11,200	3,750	$11,300	1,180	$4,760
Japan	12	186	27	62	13	179	202	1,520
Mexico	18	46	1,550	5,060	76	539	1,920	8,460
Netherlands	--	--	2,570	4,980	10	19	96	616
United Kingdom	(2)	5	146	313	21	170	104	2,090
Other	27	70	54	204	349	1,830	516	9,990
Total	5,850	14,700	11,300	21,800	4,210	14,000	4,010	27,400
2003:								
Canada	4,880	11,300	4,580	7,370	1,840	4,980	1,670	6,780
Japan	14	34	59	142	19	194	146	1,340
Mexico	28	71	5	14	261	1,910	1,790	8,730
Netherlands	10	26	3,920	7,730	(2)	3	35	95
United Kingdom	13	101	133	219	2	33	383	7,450
Other	93	234	74	238	202	1,220	234	3,930
Total	5,030	11,800	8,770	15,700	2,330	8,330	4,260	28,300

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 6

U.S. IMPORTS FOR CONSUMPTION OF MAGNESIUM, BY COUNTRY[1]

Country	Waste and scrap Quantity (metric tons)	Waste and scrap Value (thousands)	Metal Quantity (metric tons)	Metal Value (thousands)	Alloys (magnesium content) Quantity (metric tons)	Alloys (magnesium content) Value (thousands)	Powder, sheets, tubing, ribbons, wire, other forms (magnesium content) Quantity (metric tons)	Powder, sheets, tubing, ribbons, wire, other forms (magnesium content) Value (thousands)
2002:								
Brazil	--	--	1,220	$2,810	6	$20	--	--
Canada	10,200	$15,600	6,810	18,300	25,200	72,900	1,940	$11,000
China	116	132	91	152	11,000	17,800	1	29
Israel	39	33	5,850	14,500	2,390	6,860	--	--
Italy	2,030	3,710	--	--	--	--	--	--
Kazakhstan	--	--	994	1,990	--	--	--	--
Mexico	47	60	21	35	296	1,680	114	350
Russia	--	--	14,600	25,600	1,860	3,870	--	--
United Kingdom	211	217	11	31	390	3,620	2	161
Other	1,390 r	1,150 r	223 r	465 r	718 r	1,880 r	39	710 r
Total	14,100	20,900	29,900	63,900	41,900	109,000	2,090	12,200
2003:								
Brazil	--	--	781	1,600	--	--	--	--
Canada	10,100	14,600	2,320	6,650	21,100	61,800	1,030	8,790
China	156	215	89	175	11,900	20,900	63	228
Israel	--	--	4,790	11,500	893	2,360	--	--
Italy	3,910	5,900	--	--	--	--	--	--
Kazakhstan	--	--	1,250	2,360	--	--	--	--
Mexico	31	24	--	--	124	259	28	114
Russia	--	--	18,000	31,100	3,400	6,370	1	12
United Kingdom	164	171	1	4	439	3,750	22	675
Other	1,790	1,170	78	161	889	3,460	22	513
Total	16,200	22,000	27,300	53,600	38,800	98,900	1,160	10,300

r Revised. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 7
WORLD ANNUAL PRIMARY MAGNESIUM
PRODUCTION CAPACITY, DECEMBER 31, 2003[1, 2]

(Metric tons)

Country	Capacity
Brazil	12,000
Canada	120,000
China	346,000
India	900
Israel	27,500
Kazakhstan	10,000
Russia	40,000
Serbia and Montenegro	5,000
Ukraine	15,000
United States	45,000
Total	621,000

[1]Includes capacity at operating plants as well as at plants on standby basis.

[2]Data are rounded to no more than three significant digits; may not add to total shown.